CIRCULAR WQB 4

MONTANA DEPARTMENT

OF

HEALTH AND ENVIRONMENTAL SCIENCES

STANDARDS

FOR

MULTI-FAMILY SEWAGE SYSTEMS

AND

PUBLIC SUBSURFACE SEWAGE TREATMENT SYSTEMS

1992 Edition

FOREWORD

The Board of Health and Environmental Sciences of the State of Montana as authorized by 75-6-103(2)(f), MCA hereby adopts the following standards.

These standards, based on proven technology, set forth requirements for the design and preparation of plans and specifications for subsurface sewage systems.

The terms **shall** and must are used where practice is sufficiently standardized to permit specific delineation of requirements or where safeguarding of the public health justifies such definite action. These mandatory items serve as a check list for the reviewing authority. Other terms, such as **should**, recommended, and preferred, indicate desirable procedures or methods. These non-mandatory items serve as guidelines for designers.

The term "reviewing authority" as used in these standards refers to the Montana Department of Health and Environmental Sciences or a delegated division of local government.

Users of these standards need to be aware that subsurface sewage treatment systems are considered to be EPA Class V injection wells and may require associated permits. Of particular concern are systems receiving wastewater from industries and automotive service stations.

These standards are a revision of the department's Circular No. 84-10, July 1984 Edition. Circular No. 84-10 was based on the Recommended Standards for Individual Sewage Systems, 1980 Edition, prepared by the Great Lakes Upper Mississippi River Board of Sanitary Engineers. The Board of Health and Environmental Sciences acknowledges this basis and expresses its appreciation to the Great Lakes Upper Mississippi River Board of State Sanitary Engineers for its contribution to public health.

CHAPTER 10

SUBMITTAL REQUIREMENTS

For those facilities which require approval, information shall be provided by means of a report and plans and specifications. Two copies of the final plans and specifications must be submitted. An approved set will be returned to the applicant.

10.1 Report

10.101 The following information shall be provided in a report:

a. Quantity of sewage flow and how it was determined (see Chapter 30),

b. Depth to seasonal high groundwater and potential for groundwater mounding and how this information was obtained (see Section 40.5),

c. Percolation test results in the immediate vicinity of proposed drainfield(s) (see Section 40.6),

d. Soil description, and how it was determined (see Section 40.5),

e. Depth to bedrock (see Section 40.5),

f. Name of person(s) who prepared soil descriptions, performed percolation tests and applicable experience of that person,

g. For systems having more than one septic tank and one initial drainfield, a schematic of the system (i.e. a hydraulic profile) showing elevations of ground surface, pipe inverts, treatment components and water surfaces in treatment components,

h. USDA Soil Conservation Service soil survey for site, if available (see Section 40.4).

10.2 Plans and Specifications

10.201 The following information shall be provided in the plans and specifications:

a. Location, size, slope, materials and installation procedures of building and private sewers (see Chapter 20),

b. Elevation of sewer inverts and ground surface (see Chapter 20),

c. Location of manholes and cleanouts (see Chapter 20),

d. Location and design of septic tank and subsurface treatment system and 100% replacement area (see Chapters 50 and 60),

e. Location of proposed and existing wells and water lines in the area of the proposed development and land adjacent to it, (see Sections 50.102 and 60.2),

f. Lot boundaries, (see Sections 50.102 and 60.2),

g. Location of watercourses, irrigation ditches, lakes and impoundments including the 100 year floodplain in the immediate area, (see Sections 50.102 and 60.202),

h. Ground surface contours with maximum intervals of two feet, (see Section 40.701),

i. Location of soil profile holes and percolation test holes, (see Section 40.5 and 40.6),

j. North point and scale in feet.

10.3 Deviations

10.301 Deviations from the mandatory requirements of this circular for public systems may be granted by the MDHES Water Quality Bureau (WQB) Deviation Review Committee. Deviations are categorized as either "general" or "limited". General deviations, after having been approved, serve as addenda to this circular and represent current MDHES requirements. Limited deviations are granted on a case-by-case basis and are applicable to specific projects.

10.302 Procedure

a. A person desiring a deviation shall make a request in writing. The request shall identify the specific section of the circular to be considered. Adequate justification for the deviation must be provided. "Engineering judgment" or "professional opinion" without supporting data shall be considered inadequate justification.

b. A panel of three persons from the WQB shall review the request. The panel will make final determinations on limited deviations.

c. The Chief of the WQB shall make the final determination on general deviations. Approved general deviations will periodically be distributed to communities and consulting engineers.

d. A file of all deviations shall be maintained by the WQB.

CHAPTER 20

DESIGN OF SEWERS

20.1 Definitions

20.101 House or Building Drain

The pipe extending from the interior plumbing to a point two feet outside the foundation wall.

20.102 House or Building Sewer

The pipe connecting the house or building drain to the public sewer or private sewer.

20.103 Private Sewer

A private sewer is a sewer receiving the discharge from more than one building sewer and conveying it to a public sewer system or sewage treatment system.

20.2 Separation of Water and Sewer Lines

20.201 Sewers shall be laid at least 10 feet horizontally from any existing or proposed water line. The distance shall be measured edge to edge.

20.202 Sewers crossing water lines shall be laid to provide a minimum vertical distance of 18 inches between the outside of the water line and the outside of the sewer. This shall be the case where the water line is either above or below the sewer. The crossing shall be arranged so that the sewer joints will be equidistant and as far as possible from the water line joints. Where a water line crosses under a sewer, adequate structural support shall be provided for the sewer to prevent damage to the water line.

20.3 Sewer Size, Slope, and Design Flows for Building and Private Sewers

20.301 Only sanitary sewage shall be placed into the sanitary sewer system. Rain water from roofs, streets, and other areas, and groundwater from foundation drains shall be excluded.

20.302 Flow used for designing sewers shall consider

ultimate tributary population, maximum hourly sewage flow, and possible infiltration.

20.303 The minimum size of a building sewer or private sewer shall be four inches and shall be placed at a minimum slope of one-fourth of an inch per foot toward the point of discharge, provided that where it is impractical, due to the depth of the street sewer or to the structural features or to the arrangement of any building or structure to obtain such a slope, any such piping which is four inches to six inches may have a slope of not less than one-eighth of an inch per foot when approved by the reviewing authority. Eight inch and larger sewer shall be designed in conformance with the requirements for community wastewater systems.

20.4 Sewer Materials

20.401 Building or private sewers shall be PVC.

20.402 PVC sewer pipe shall meet the requirements of ASTM D 3034, ASTM D 2729, or ASTM D 1785 (schedule 40) and be joined by an integral wall bell and rubber elastomeric gasket or solvent cement joints.

20.405 Transition connections to other materials shall be made by adapter fittings or one piece molded rubber couplings with appropriate bushings for the respective materials. All fittings shall be at least of equivalent durability and strength of the pipe itself.

20.5 Sewer Installation

20.501 In general, sewers shall be sufficiently deep to receive sewage from basements and to prevent freezing. Insulation shall be provided for sewers that cannot be placed at a depth sufficient to prevent freezing.

20.502 Sewers shall be laid at a uniform slope between cleanouts and/or manholes.

20.503 Sewers shall be laid with straight alignment between cleanouts and/or manholes.

20.504 Installation specifications shall contain appropriate requirements based on the

criteria, standards and requirements established by industry in its technical publications. Requirements shall be set forth in the specifications for the methods of bedding and backfilling the pipe.

20.6 Cleanouts and Manholes

20.601 Manholes shall be installed on private sewers at the end of lines, at all changes in grade, size or alignment and at distances not greater than 400 feet. The reviewing authority may approve cleanouts as substitutes for manholes where justification can be shown for their usage.

20.602 The minimum diameter of manholes shall be 48 inches.

20.603 The flow channel through manholes shall be made to conform in shape and slope to that of the sewers.

20.604 Manholes shall be watertight. Covers of adequate strength for safety and adequate watertightness to prevent entrance of storm runoff to the sewers shall be provided.

20.605 Inlet and outlet pipes shall be joined with a gasketed flexible watertight connection or any watertight connection arrangement that allows differential settlement of the pipe and manhole wall to take place. A bell and spigot pipe joint with rubber sealing ring, located within 12 inches of the manhole wall satisfies this requirement.

20.7 Sewage Pumping Stations

20.701 Sewage pumping stations which receive sewage from private sewers which have not had settleable solids removed shall be designed in accordance with the "Recommended Standards for Sewage Works" as published by the Great Lakes-Upper Mississippi River Board of State Sanitary Engineers.

20.702 Stations which receive sewage from private sewers which have had the settleable solids removed shall be provided with pumps and controls which are corrosion resistant and meet the requirements for National Electrical

Code Class I, Division 2 locations. An audible or visible alarm shall be provided to indicate failure of the system.

CHAPTER 30

WASTEWATER FLOW

The purpose of this chapter is to provide a method for estimating wastewater flows.

30.1 Residential Wastewater Flows

Design wastewater flow for single family dwelling units having three bedrooms or less shall be 350 gallons per day. A contribution of 100 gallons per day per bedroom shall be added for each bedroom beyond three in number.

30.2 Nonresidential Wastewater Flow

Typical daily flows for a variety of commercial, institutional and recreational establishments are presented in Tables 30-1, 30-2 and 30-3. The typical flows shall be utilized as minimum design flows. Greater design flows may be required where larger flows are likely to occur such as resort areas.

30.3 Graywater

Graywater shall be provided the same treatment required for other wastewater.

TABLE 30-1
TYPICAL WASTEWATER FLOWS FROM COMMERCIAL SOURCES

Source	Unit	Wastewater Flow gpd/unit Range		Typical
Airport	Passenger	2.1	4.0	2.6
Automobile Service Station				
	Vehicle Served	7.9	13.2	10.6
	Employee	9.2	15.8	13.2
Bar	Customer	1.3	5.3	2.1
	Employee	10.6	15.8	13.2
Hotel	Guest	39.6	58.0	50.1
	Employee	7.9	13.2	10.6
Industrial Building (excluding industry and cafeteria)	Employee	7.9	17.2	14.5
Laundry	Machine	475	686	580
	Wash	47.5	52.8	50.1
Motel	Person	23.8	39.6	31.7
Motel with Kitchen	Person	50.2	58.1	52.8
Office	Employee	7.9	17.2	14.5
Restaurant	Meal	2.1	4.0	2.6
Rooming House	Resident	23.8	50.1	39.6
Store, Department	Toilet Room	423	634	528
	Employee	7.9	13.2	10.6
Shopping Center	Parking Space	0.5	2.1	1.1
	Employee	7.9	13.2	10.6

TABLE 30-2

TYPICAL WASTEWATER FLOWS FROM INSTITUTIONAL SOURCES

Source	Unit	Wastewater Flow gpd/unit Range		Typical
Hospital, Medical	Bed	132	251	172
	Employee	5.3	15.9	10.6
Hospital, Mental	Bed	79.3	172	106
	Employee	5.3	15.9	10.6
Prison	Inmate	79.3	159	199
	Employee	5.3	15.9	10.6
School, Day:				
With Cafeteria, Gym, Showers	Student	15.9	30.4	21.1
With Cafeteria Only	Student	10.6	21.1	15.9
Without Cafeteria, Gym, Showers	Student	5.3	17.2	10.6
School, Boarding	Student	52.8	106	74.0

TABLE 30-3

TYPICAL WASTEWATER FLOWS FROM RECREATIONAL SOURCES

Source	Unit	Wastewater Flow gpd/unit Range		Typical
Apartment, Resort	Person	52.8	74	58.1
Cabin, Resort	Person	34.3	50.2	42.3
Cafeteria	Customer	1.1	2.6	1.6
	Employee	7.9	13.2	10.6
Campground (developed)	Person	21.1	39.6	31.7
Cocktail Lounge	Seat	13.2	26.4	19.8
Coffee Shop	Customer	4.0	7.9	5.3
	Employee	7.9	13.2	10.6
Country Club	Member Present	66.0	132	106
	Employee	10.6	15.9	13.2
Day Camp (no meals)	Person	10.6	15.9	13.2
Dining Hall	Meal Served	4.0	13.2	7.9
Dormitory, Bunkhouse	Person	19.8	46.2	39.6
Hotel, Resort	Person	39.6	63.4	52.8
Laundromat	Machine	476	687	581
Store, Resort	Customer	1.3	5.3	2.6
	Employee	7.9	13.2	10.6
Swimming Pool	Customer	5.3	13.2	10.6
	Employee	7.9	13.2	10.6
Theater	Seat	2.6	4.0	2.6
Visitor Center	Visitor	4.0	7.9	5.3
Travel Trailer Parks without Individual Water and Sewer Hook-ups	Space			50
Travel Trailer Parks with Individual Water and Sewer Hook-ups	Space			100

CHAPTER 40

SITE EVALUATION

Information concerning soil and site conditions is needed for the design of liquid waste treatment and disposal facilities. Those factors which must be evaluated are depth of permeable soil over seasonal high groundwater, bedrock, or other limiting layer, soil factors, land slope, flooding hazard, and amount of suitable area available.

40.1 Soil Factors

Soil texture and structure, stabilized percolation rate, groundwater and bedrock conditions must be evaluated.

40.2 Definitions

40.201 Bedrock

Any rock which cannot be readily excavated by power equipment, or is so slowly permeable that it will not transmit effluent, or has open fractures or solution channels.

40.202 Seasonal High Groundwater Level

The vertical distance from the natural ground surface to the groundwater surface as observed as a free water surface in an unlined hole during the time of the year when the groundwater is the highest, or has been saturated as may be indicated by mottling (soil color patterns).

40.203 Limiting Layer

Any layer of soil with a stabilized percolation rate slower than 60 minutes per inch.

40.3 Evaluation of Soil Factors

Soil factors shall be evaluated by soil profile observations representative of site and be supported by percolation tests.

40.4 Existing Soil Information

Soil surveys are usually found at the local USDA Soil Conservation (SCS) office. While the soil surveys offer good preliminary information about an area, they are not

complete nor can they substitute for a field study. However, they are good for determining potential problems which may exist. If available, the appropriate section of the SCS survey should be provided.

40.5 Soil Profile Observations

Soil pits are recommended for soil observation. The minimum depth of soil profile observations shall be at least seven feet except that at least 10 feet should be profiled where design flow is greater than 1,000 gallons per day and that a minimum of one test pit per 1/3 acre of drainfield be provided. The following factors must be evaluated to the full depth of the holes and reported:

a. Thickness of layers or horizons,

b. Texture (USDA) of soil layers,

c. Color (preferably described by using the notation of the Munsell color scheme) and color variation (mottling),

d. Depth to water, if observed,

e. Depth to estimated seasonal high groundwater level,

f. Depth to and type of bedrock, if observed,

g. Stoniness reported on a volume basis (i.e. the percentage of the soil volume occupied by particles greater than 2 mm in diameters),

h. Plasticity, and,

i. Other prominent features such as structure, roots, etc.

40.6 Percolation Tests

Soil percolation tests should be conducted at the optimal depth based on soil profile textures indicating permeable conditions. At least three percolation tests shall be performed per site. They shall be conducted at the depth of proposed construction. Additional percolation tests may be needed to identify the existence of a limiting layer. The percolation tests shall be performed in accordance with procedure contained in Appendix A.

40.7 Site Factors

The land slope, potential for flooding and surface water concentration, amount of suitable area must be evaluated.

40.701 Type and percent of land slope

The type (concave, convex, or plane), percent and direction of land slope must be determined and reported.

40.702 Flooding and surface water

The potential for flooding or accumulation of surface water from storm events shall be evaluated.

40.703 Amount of suitable area

Sufficient suitable soil must be available for the initial absorption area while maintaining the minimum horizontal isolation distances required to protect water supply, surface waters, property lines, etc. It is required that sufficient suitable area be available for initial and replacement absorption systems.

40.704 Groundwater Quality Impact

An assessment of the impact of the system on groundwater quality may be required. Special treatment may be required to meet the non-degradation requirements of the Montana Water Quality Act.

CHAPTER 50

SEPTIC TANKS

A septic tank consists of one or more chambers which provide sufficient retention time to treat the raw sewage.

50 Septic Tanks

50.1 General

50.101 Influent

All liquid waste and washwater shall discharge into the septic tank. Roof, footing, garage, surface water drainage, and cooling water shall be excluded.

50.102 Location

The septic tank shall be located where it is readily accessible for inspection and maintenance. The following are minimum horizontal separation distances that must be provided between the septic tank and the features indicated:

Buildings	10 feet
Water wells and suction lines	50 feet
Property lines	10 feet
Water supply lines under pressure	10 feet
Lakes and streams and ponds	50 feet
Cisterns	25 feet
Roadcuts, cliffs or banks	10 feet

50.2 Design

50.201 Septic tank design shall be in accordance with Figure 50.1.

50.202 Sizing

For flows of less than 1,500 gallon per day, the tank shall have a capacity of at least 1.5 times the average daily flow. For flows of greater than 1,500 gallons per day, the tank shall have a minimum capacity equal to 1,125 gallons plus 75 percent of daily wastewater flow; or $V = 1,125 + 0.75Q$ where V is the net volume of the tank in gallons and Q is the daily wastewater flow in gallons. A minimum acceptable size of septic tank is 1,000

gallons. Establishments such as restaurants which produce a lot of grease shall be provided with grease traps.

50.3 Acceptance

After installation each tank shall be free from fractures or cracks passing through the floor or walls.

50.4 Dosing

50.401 To provide storage, the total volume of the dosing tank should be equivalent to the average daily flow. The required volume of the dosing tank shall not be considered as any portion of the required volume of the septic tank. Dosing tanks must be provided with access ports sufficiently large to maintain the tank and pumps, and shall be vented. Pumps, valves and other apparatus which require maintenance shall be accessible from the surface without entering the tank or be located in a dry tank adjacent to the wet chamber.

50.402 Dosing tanks shall meet the material requirements for septic tanks and be free of fractures or cracks passing through floor or walls. Dosing tanks utilizing pumps shall meet the requirements of Section 20.702.

50.5 Maintenance

The owner of the system shall be provided with septic tank maintenance recommendations contained in Appendix B. Owners of systems with syphons, pumps or controls shall also be provided with operation and maintenance recommendations for these components.

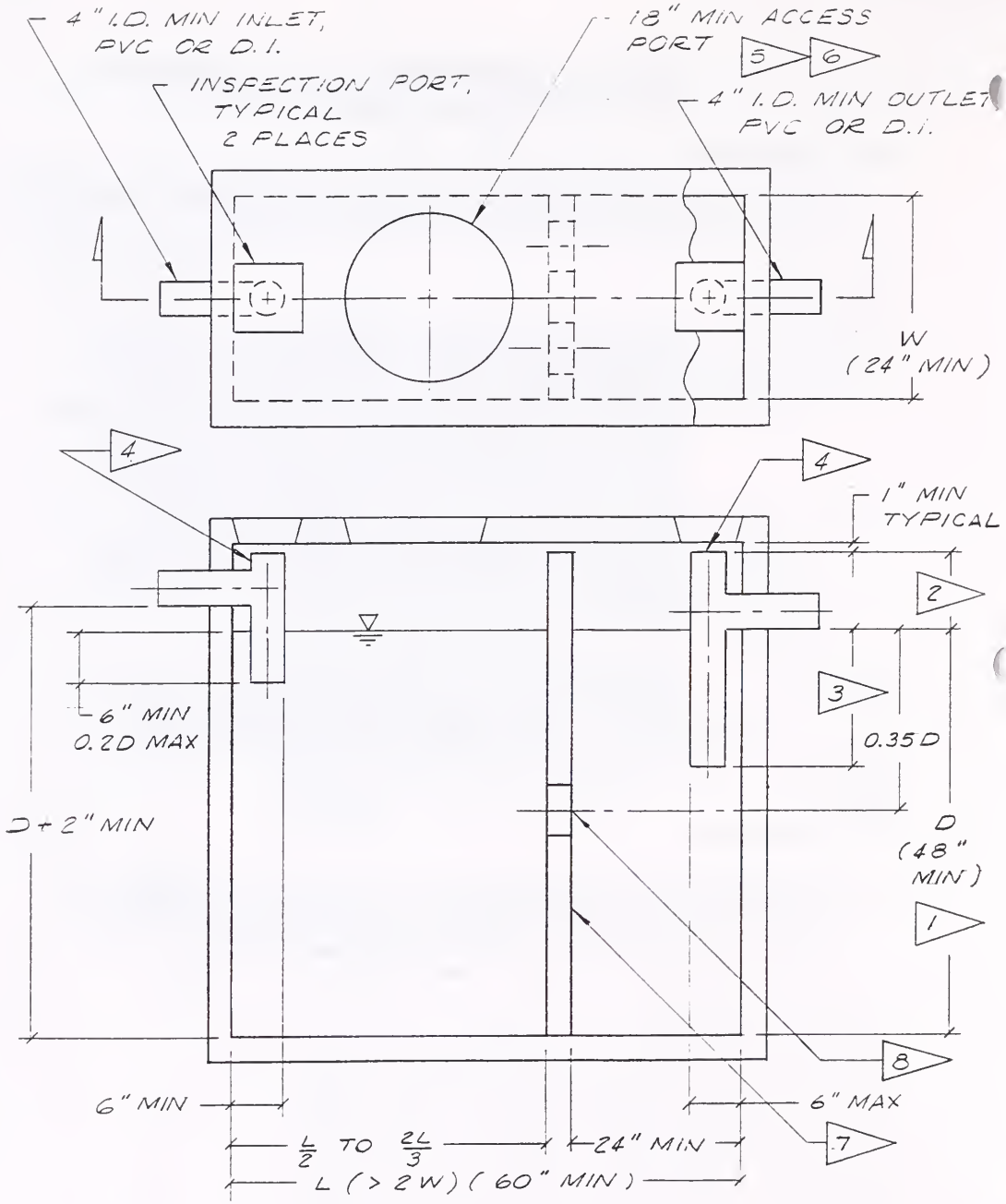

FIGURE 50.1 – SEPTIC TANK REQUIREMENTS

SYMBOLS AND ABBREVIATIONS

D	interior depth of tank from bottom to outlet invert	I.D.	inside diameter
L	interior length of tank	MIN	minimum
W	interior width of tank	MAX	maximum
		PVC	polyvinyl chloride

D.I. ductile iron

NOTES

1. Depth greater than 78 inches shall not be used in computing tank capacity.

2. Rectangular tanks: 0.2 D
Horizontal cylindrical tanks: 0.15 D

3. Rectangular tanks: 0.35 D
Horizontal cylindrical tanks: 0.3 D

4. Tanks may be equipped with baffles that meet the shown dimensional requirements. Horizontal dimensions apply to side of baffle nearest to the tank wall.

5. Access port cover elevation shall be adjusted as necessary with a riser section to within 12 inches of finished grade.

6. Access port is required for each compartment. Cover shall be provided with lifting eye.

7. Compartment wall is optional. When provided, minimum capacity of first compartment shall be 500 gallons.

8. Liquid connection between compartments shall consist of a single opening completely across the compartment wall or two or more openings equally spaced across the wall. Total area of openings shall be at least three times area of inlet pipe.

9. Tank shall be made of reinforced concrete. Concrete used shall be resistant to the corrosive environment found in septic tanks. Other materials may be acceptable when proven suitable to the reviewing authority. The empty tank shall be capable of withstanding loads created by six feet of burial.

10. The installed tank shall be free from fractures or cracks passing through the floor or walls.

11. The tank shall provide an air space having a volume not less the ten percent of its liquid capacity.

FIGURE 50.1 - SEPTIC TANK REQUIREMENTS (continued)

CHAPTER 60

CONVENTIONAL SUBSURFACE SEWAGE TREATMENT SYSTEMS

The common design of treatment systems is one using absorption trenches, each separate from the other and each containing a distribution pipe. This type of system should be used whenever practical. Other types of absorption systems may be used as alternatives where the site conditions meet the specific design requirements of such alternative systems.

60 Absorption Trenches

60.1 General

The satisfactory operation of the sewage disposal system is largely dependent upon proper site selection, design, and construction of absorption trenches.

60.2 Location

60.201 Absorption trenches shall be located at least 100 feet from a potable water supply or pump suction line. Greater horizontal separation distances may be needed depending on engineering and hydrogeological data and type of water supply.

60.202

a. Absorption trenches shall be located at least 100 feet from the 100 year flood level of any river, stream, water course, lake or impoundment unless a waiver has been provided by the reviewing authority. A waiver may only be provided if:

   i. The water course is an irrigation ditch and the groundwater flow at the drainfield site will not enter the irrigation ditch, or

   ii. The river or stream average yearly highwater mark is a minimum of 100 feet from the drainfield and the bottom of the drainfield will be at least four feet above the 100 year flood elevation.

b. Where the floodplain has not been designated and its level relative to a treatment system is in question, delineation of the floodplain will be referred to the Department of Natural

Resources and Conservation for determination.

60.203 Absorption trenches shall be at least ten feet from water lines, property lines and buildings.

60.204 Absorption trenches shall be at least 25 feet from roadcuts, cliffs or banks.

60.205 Absorption trenches shall not be constructed in soils having a percolation rate slower than 60 minutes per inch unless an "alternative" system is utilized. Where rapid percolation may result in contamination of water-bearing formations or surface waters an "alternative" system shall be utilized. See MDHES Circular WQB 5 for "alternative" treatment systems.

60.206 Absorption trenches shall not be constructed in soils rated as having severe or very severe limitations for subsurface sewage disposal by the Soil Conservation Service, U.S. Department of Agriculture, unless that limitation is not present as shown by field investigation or can be overcome.

60.207 Absorption trenches of conventional systems shall be located to maximize the vertical separation distance from the bottom of the absorption trenches to the seasonal high groundwater level, bedrock, or other limiting layer, but under no circumstances shall this vertical separation be less than four feet. See MDHES Circular WQB 5 for "alternative" system separation distances. Where water-bearing formations are in danger of contamination greater vertical separation may be required.

60.208 Absorption trenches shall not be constructed in unstabilized fill and only in stabilized fill if a waiver has been provided by the reviewing authority. See MDHES Circular WQB 5 for stabilized fill requirements.

60.209 Provisions shall be made to keep vehicular traffic from drainfield area when such activity is likely.

60.3 Design

60.301 Each absorption trench system shall have a minimum of two trenches.

60.302 The minimum area in any absorption trench system shall be based upon the flow as determined in Chapter 30 and in accordance with the following table:

Soil Texture	Percolation Rate in min/inch	Application Rate gpd/ft2
Gravel, coarse sand	< 3	Not suitable for standard absorption system
Coarse to medium sand	3-5	1.2*
Fine sand, loamy sand	6-15	0.8
Sandy loam, loam, sandy clay loam	16-30	0.6
Porous silt loam, sandy clay**	31-45	0.5
Clay loam, silty clay loam, silt loam**	45-60	0.44

* See Section 60.205
** Soils without expandable clays

60.303 An area that can used as a replacement area of the original absorption trench system shall be designated. Interim use of the area shall be compatible with future absorption system use.

60.304 Absorption trenches shall be separated by at least five feet between trench walls except four feet may be utilized where the system is dosed.

60.305 Absorption trenches shall be at least 18 inches wide and no more than 24 inches wide except 36 inches shall be utilized where the system is dosed. See Figure 60.1.

60.306 The bottom of the absorption trenches shall be at least 18 inches and no more than 36 inches below the finished grade unless a waiver has been obtained. See MDHES Circular WQB 5 and Section 61 of this circular.

60.307 Gravity fed absorption trenches shall not exceed 100 feet in length.

60.308 Gravity fed absorption field distribution lines shall be four inches in diameter.

60.4 Slope

60.401 Gravity fed and dosed absorption field distribution lines and trenches shall be level.

60.402 Absorption trenches should not be installed on land with a slope gradient greater than 15%. Absorption trenches may be installed on slopes between 15 and 25% if special conditions approved by the reviewing authority are met.

60.5 Material

60.501 Gravity fed distribution lines shall be fabricated from four inch diameter ASTM D 2729 or ASTM D 3034 PVC sewer pipe with perforations per ASTM D 2729.

60.502 Coiled perforated plastic pipe shall not be used when installing absorption systems. Straight lengths of pipe shall be used instead.

60.503 Pipe used for dosed distribution lines shall meet an appropriate ASTM standard or those of an equivalent standard. Fittings used in the absorption field shall be compatible with the materials used in the distribution lines.

60.504 Gravel or crushed stone shall be washed and shall range in size from three-fourths to two and one-half inches. The material must be of sufficient competency to resist slaking or dissolution. Gravels of shale sandstones, or limestones may degrade and shall not be used.

60.505 The material used to cover the top of the stone shall be plastic porous filter fabric or several layers of untreated building paper. Five inches of straw may be substituted when these materials are unavailable. Non porous plastic or treated building paper shall not be used.

60.6 Construction

60.601 Pipes from septic tanks shall have solid walls and minimum downward slopes of 1/8 inch per foot.

60.602 A manifold shall be installed between the septic tank and the absorption trenches. The manifold shall be of water-tight construction. Distribution boxes may be used in gravity systems in lieu of manifolds.

60.603 Both manifolds and distribution boxes shall be set level and arranged so that effluent is evenly distributed to each distribution line. Special provisions shall be made to minimize movement of distribution boxes due to settlement or frost heave. Access for inspection of the distribution box shall be provided.

60.604 When distribution boxes are used, each distribution line shall connect individually to a distribution box.

60.605 The pipe connecting a manifold or distribution box to a distribution line shall be solid wall with tight joints and properly bedded throughout its length.

60.606 When a manifold is used, there shall be an equal number of distribution lines spaced evenly on both sides of the junction of the inlet pipe to the manifold.

60.607 Distribution lines from a common manifold or distribution box shall be equal in length.

60.608 When the trenches have been excavated, the sides and bottom shall be raked to scarify any smeared soil surfaces. Construction equipment not needed to construct the system should be kept off the area to be utilized for the absorption trench system to prevent undesirable compaction of the soils. Construction shall not be initiated when the soil moisture content is high. (Note: If a fragment of soil occurring approximately nine inches below the surface can easily be rolled into the shape of a wire, the soil moisture content is too high for construction

purposes.)

60.609 At least six inches of gravel or crushed stone shall be placed in the bottom of the trench.

60.610 The distribution line shall be carefully placed on the bedding and covered with at least two inches of gravel or stone.

60.611 The ends of the distribution lines shall be capped or plugged or, when they are at equal elevations, they should be connected.

60.7 Dosing System Design

60.701 Dosing is recommended for all systems and shall be provided when the design sewage flow requires more than 500 lineal feet of distribution line except at noted in 60.8. Pressure distribution should be utilized whenever practical.

60.702 Dosing may be accomplished by either pumps or siphons. The system shall be dosed not more than four times per day. For nonpressurized systems the volume of each dose shall be the greater of the daily sewage volume divided by the daily dosing frequency, or an amount equal to 3/4 of the internal volume of the distribution lines being dosed.

60.703 In a system using pressure distribution, the field shall be dosed not more than four times per day. The dose volume of a pressurized system shall be equal to the drained volume of the discharge pipe and manifold plus a volume that should be 10 times but shall not be less than five times the distribution pipe volume. The size of the dosing pumps and siphons shall be selected to provide a minimum pressure of one psi (2.3 feet of head) at the end of each distribution line.

60.704 The pressure distribution pipe shall be PVC pipe. The pipe shall have a single row of perforations 3/16 inch diameter or larger in a straight line along the bottom of the pipe. Maximum perforation spacing shall be 5 feet. An equivalent design that assures uniform distribution may be provided with the approval of the reviewing authority.

60.705 The time of each discharge shall not exceed 15 minutes to promote uniform distribution.

60.706 A hydraulic analysis demonstrating uniform distribution shall be provided. The analysis shall show no greater than 10 percent variation in distribution of dose across the entire drainfield.

60.707 Distribution pipes at the corners and side midpoints of dosed drainfields shall have capped inspection risers that terminate slightly below ground surface. A metal location marker shall be provided for each inspection riser.

60.708 Dosing chambers shall be designed so that pumps and valves are readily accessible without entering the chamber.

60.709 High water alarms shall be provided for all dosing chambers which utilize pumps.

60.710 Pressure distribution systems shall be field tested to demonstrate uniform flow distribution prior to acceptance.

60.8 Alternating Absorption Area Design

60.801 Under some circumstances, it is desirable to divert the wastewater flow from one soil absorption area to another to provide long-term alternate resting periods. Flow diversion may be accomplished by the use of commercially available diversion valves or by diversion boxes.

60.802 Alternating absorption area design may be utilized as a substitute for dosing systems. Where this design is utilized, an additional absorption area of 50% shall be provided. Three sections are recommended with a minimum distance of 10 feet between sections.

61. Deep Absorption Trenches

61.1 General

A waiver must be approved in order to use this type of system. Deep absorption trenches may be considered where the depth of suitable soil is insufficient to permit the installation of a conventional trench system due to the

presence of a limiting layer more than two feet in depth which overlies suitable soils of sufficient thickness or where freezing may be a problem due to long absence of the inhabitants during the winter. Requirements for location, design, slope, material, construction and dosing system design contained in Section 60, Absorption Trenches, shall apply to deep absorption trenches except for depth of construction (60.306). In addition, the following design considerations shall apply:

a. The site evaluation procedures shall include soil profile observations of at least three soil observation pits constructed to a minimum depth of six feet below the proposed trench bottom. Monitoring to establish depth to seasonal soil saturation or groundwater may be required. The possibility of groundwater contamination shall be considered in accordance with Sections 60.201 and 60.206.

b. Deep absorption trenches shall be constructed at least one foot into suitable soil.

c. The distribution piping in deep absorption trenches shall be installed with the invert of the piping at a depth of not more than 48 inches. Washed gravel or crushed stone shall be placed from the bottom of the trench excavation to a point two inches above the top of the distribution piping.

d. Deep absorption trenches shall not be used when there is a danger of contaminating the groundwater.

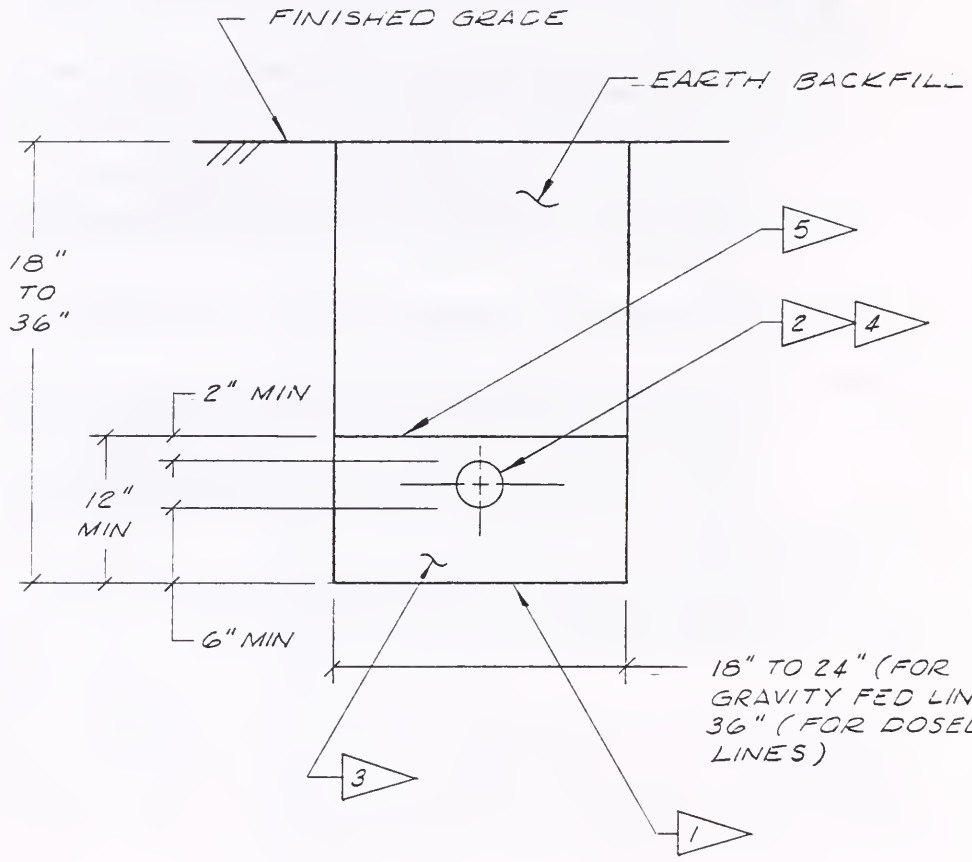

FIGURE 60.1 - ABSORPTION FIELD TRENCH REQUIREMENTS

NOTES

1. Gravity fed and dosed trench bottoms shall be level.

2. Gravity fed distribution lines shall be fabricated from 4 inch nominal diameter ASTM D 2729 or ASTM D 3034 PVC sewer pipe with perforations per ASTM D 2729.

3. Gravel or crushed stone. It shall be washed and shall range in size from 3/4 to 2 1/2 inches. The material shall be hard and resistant to slaking or dissolution.

4. Gravity fed and dosed distribution lines shall be level.

5. Gravel shall be covered with either plastic porous filter fabric or several layers of untreated building paper. Five inches of straw may be used when these materials are unavailable.

6. Sides and bottoms of trenches shall be raked to scarify any smeared soil surfaces. Construction equipment not needed to construct the system should be kept off the area to be utilized for the absorption trenches to prevent undesirable compaction of the soils. Construction shall not be initiated when the soil moisture content is high. If a fragment of soil occurring approximately nine inches below the surface can easily be rolled into the shape of a wire, the soil moisture content is too high for construction purposes.

FIGURE 60.1 - ABSORPTION FIELD TRENCH REQUIREMENTS (continued)

APPENDIX A

PERCOLATION TEST PROCEDURE

General

Properly conducted percolation tests are needed to determine drainfield site suitability and to size the drainfield.

Test Hole Preparation

1. Dig or bore holes approximately six inches in diameter with vertical sides. Depth of holes shall be equal to the depth of the proposed drainfield trenches.

2. Roughen or scratch the bottoms and sides of the holes to provide natural unsmeared surfaces. Remove loose material. Place about two inches of 1/2 to 3/4 inch washed gravel in the bottom of holes to prevent scouring during water addition.

3. Establish a reference point for measurements in each hole.

Soaking

1. Fill holes with clear water to a level of at least 12 inches above the gravel.

2. In sandy soils, add 12 inches of water a second time. If the second filling seeps away in 60 minutes or less, proceed with test.

3. In other soils, maintain at least 12 inches of water in the hole for at least four hours to presoak soil. Do not remove water remaining after four hours. Permit soil to swell at least 12 hours.

Test

1. Sandy Soils

    a. Add water to provide a depth of six inches above gravel. Measure water level drops every 10 minutes for one hour.

    b. Use a shorter time interval if first six inches seeps away in ten minutes or less. Refill when necessary. Do not exceed six inch depth of water. Use final water level drop to calculate rate.

2. Other Soils

a. Remove loose material on top of gravel.

b. Adjust water level to six inches above gravel. Measure water level drops every 30 minutes for four hours or until two successive drops do not vary by more than 1/16 inch (stabilized rate achieved).

c. If first six inches of water seeps away in less than 30 minutes, use a 10 minute interval and run for one hour.

d. Refill with water only when necessary. Do not exceed six inch depth of water. Adjust water depth for the last three measurement periods such that they start with the same depth. Use final water level drop to calculate rate.

Records

Record the following information:

1. Date(s) of test(s),
2. Location and depth of each test hole,
3. Time of day that each soak period began and ended,
4. Time of day for beginning and end of each water level drop interval,
5. Each water level drop measurement,
6. Name of person performing test,
7. Name of owner or project name.

Rate Calculation

$$\text{Percolation Rate} = \frac{\text{Time Interval in Minutes}}{\text{Water Level Drop in Inches}}$$

APPENDIX B

SEPTIC TANK MAINTENANCE

General

The proper maintenance of the septic tank is essential in **preventing** premature **drainfield failure.** The primary function of the septic tank is to remove solids that otherwise would overload and clog the drainfield. A secondary function is to partially stabilize accumulated solids through anaerobic decomposition.

It is a violation of Federal and State law to dispose of various organic and inorganic wastes such as paint thinners, solvents and pesticides using septic tank and drainfield systems. Protection of groundwater quality is the reason for the laws.

Pumping

The single most important thing that the owner can do to extend the life of his drainfield is to keep from overfilling the septic tank with sludge. The difficulty in doing this is knowing when to have the tank pumped. It is possible for an owner to measure sludge depths and scum accumulations himself and then have the tank pumped when recommended limits are reached. Few owners, however, are inclined to make these measurements.

Another approach is to have the tank pumped after the first year or two of operation. At the time of initial pumping and subsequent pumpings obtain from the septic tank pumper an estimate of the sludge and scum accumulations. Keep a record of these estimates and use them to predict times for future pumping.

Dosing tanks and distribution boxes should be inspected at the same time the septic tank is pumped. Accumulated solids should be removed at that time.

Additives

There are a number of additives on the market that claim to improve the performance of septic tanks. Many claim to reduce sludge accumulation by improved digestion of solids. If such action did take place it could transfer solubilized solids to the drainfield, defeating the primary function of the septic tank. For this reason, the use of biological and chemical additives is definitely **not recommended.**

Inspection

Septic tanks often contain toxic gases. As consequence, only trained persons with proper safety equipment should attempt to enter or repair a septic tank.